DEPARTMENT OF OPTOMETRY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

UNIVERSITY OF GONDAR

PREVALENCE AND ASSOCIATED FACTORS OF COMPUTER VISION SYNDROME AMONG BANK WORKERS IN GONDAR CITY, NORTHWEST ETHIOPIA, 2015.

PRINCIPAL INVESTIGATOR:

Mr. NATNAEL LAKACHEW

ADVISORS:

Mr. DAWIT ZENEBE (BSc, MPH)

Mr. HAILE WORETAW (BSc, MSc)

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Prevalence and Associated Factors of Computer Vision Syndrome among Bank Workers in Gondar City, Northwest Ethiopia, 2015.

By: Mr. Natnael Lakachew

Tele: + 251-910-08-89-03, Email: natiuog@gmail.com

Approved By:

Mr. Ayanaw Tsega _____

Head, Department of optometry

Advisors: Signature

1. Mr. Dawit Zenebe _____

2. Mr. Haile Woretaw _____

Examiner

Name: signature

_____ _____

_____ _____

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LIST OF ACRONYMS

AOR	Adjusted Odd Ratio
BSc	Bachelor of Science
CI	Confidence Interval
COR	Crude Odd Ratio
CVS	Computer Vision Syndrome
MPH	Master of Public Health
MSc	Master of Science
SPSS	Statistical Package for Social Sciences
UoG	University of Gondar
VDT	Visual Display Technologies

ABSTRUCT

Introduction: Computer users are generally encouraged; this is to keep up with the fast moving world of technology, research and science. Extensive use of computers will result computer vision syndrome and the prevalence is dramatically increased intensively. Because of limited evidence to prove the magnitude and risk of the problem, especially, in the study area, the study was conducted among bank workers who spent most of their time on computer use.

Objective: The objective of the study was to assess the prevalence and associated factors for computer vision syndrome among bank workers in Gondar city, Northwest Ethiopia, 2015.

Methods: A cross-sectional institution based study was conducted among computer user bank workers in Gondar city from April-June/2015. Data was collected through structured questionnaire; as well as observation with checklist for the identification of personal and /computer and environmental risk factors. Data was entered with EPI-INFO 7 and analyzed by SPSS version 20. Descriptive statistic and logistic regression was carried out to compute the different rates, proportion and relevant associations.

Result: Among the total 304 computer user bank workers, the prevalence of computer vision syndrome with was 73% (95% CI: 68.04, 78.02).Blurred vision (42.4%) and headache (23.0%) and redness (23.0%) were the most experienced symptoms. Inappropriate sitting position was 2.3 times (AOR=2.33, 95%CI=1.27, 4.28) more likely to exposed for computer vision syndrome as compared with appropriate sitting position. Working on the computer without break more than 20 minutes was nearly 2 times (AOR=1.93, 95%CI=1.11, 3.35) more likely suffered to have CVS as compared with taking break within 20minutes and wearing eye glass was 3 times (AOR=3.19, 95%CI=1.07, 9.51) more likely exposed for CVS as compared with not wearing glasses.

Conclusion: About three-fourth of computer user bank workers were suffered from computer vision syndrome with the most experienced symptoms of blurred vision, headache and redness of eyes. In appropriate sitting position, Working on the computer without break more than 20 minutes and wearing eye glass were independently associated with computer vision syndrome.

Key words: Computer vision syndrome, Computer users, bank workers, Gondar.

1. INTRODUCTION

1.1 Background

Over the past 20 years, there has been a great advancement in the information technology. Today, where we are living in a highly sophisticated environment, computer is one of the most developed technologies which are used presently by all age groups. More and more peoples are sitting with highly vision demanding task area in front of the computer for longer hours, which is leading cause of developing computer related vision problems.(1)

Globally, personal computers were one of the commonest office tools. Using computers had become a 21st century necessity. The use of computers in all institutions, colleges, universities and homes has made life easier and increase output tremendously. (1, 2)

Computer has become almost an indispensable piece of equipment everywhere. The introduction of computer no doubts has revolutionized and benefited the society.(1) However, their usage, even for 3 hrs/day, led to a health risk of developing computer vision syndrome (CVS), low back pain, tension headaches and psychosocial stress.(3)

More recently, visual and ocular problems are reported as the most frequently occurring health problems among computer users.(4) Ocular complaints of computer users have been grouped together and collectively termed as computer vision syndrome (CVS).(5)

The American Optometric Association defines computer vision syndrome as a complex of eye and vision problems related to the activities which stress the near vision and which are experienced in relation, or during, the use of the computer. It is characterized by visual symptoms which result from interaction with computer display or its environment.(6)

To date the use of computers is widely distributed throughout the world and the associated ocular complaints are found in 75-90% of the population of computer users.(7)

1.2 Statement of the problem

Computer Vision Syndrome is common ailment in majority of people who continuously use laptops, mobile Internet and other technology gadgets that strain the eye.(8)

The term CVS is an umbrella that covers numerous conditions which are eye and environmental related condition that occurs when the viewing demands of the task exceeds the visual abilities of the user leading to inability to focus properly on computer images. The eyes cannot remain focused on the pixel-generated images on a computer screen and as such, the eyes must focus and refocus thousands of times per day while viewing the screen.(9)

Because of the extensive use of computers among computer operators including bank workers the prevalence is dramatically increased intensively. Nearly 60 million people suffer from CVS globally: A million new cases of CVS occur each year. (3)

Computer vision syndrome can also be presented with asthenopic symptoms of eyes such as eye strain, irritation, redness, fatigue, headaches, burning sensation, glare sensitivity, double vision and periodic blurring of near and distant vision.(10)

Apart from the duration of usage, factors such as the contrast (intensity of the light) of the word to the background , poor lighting, glare, screen brightness, vision problems and improper workstation setup also account for eye and visual problems associated with computer usage.(11) Sustained periods of close screen work results in visual fatigue symptoms such as sore eyes and increased glare sensitivity.(12)

Studies have long shown that the computer screen is a very different visual environment from the printed page. Made up of tiny dots or “pixels,” the computer screen is difficult for the eye to focus on steadily. Poor definition of these images, compared with the clarity of a printed page, causes the eyes to work harder. This forces our eye muscles to refocus continuously, subconsciously while we look at the computer screen. This effort can amount to thousands of focusing cycles in a typical workday. Over time it creates the various symptoms known collectively as eyestrain.(13)

Refresh rate refers to the number of times (per minute) the computer screen is repainted to produce an image. When the refresh rate is too slow it causes a flickering screen. Studies have proven that a higher refresh rates is associated with less flickering thus decreases ocular symptoms and more user friendly. Extremely low refresh rates (high flickering) is known to be associated with headache, fatigue, irritability and epileptic seizures.(14)

Factors contributing to computer vision syndrome generally classified as: Personal factors-Poor seating position, Improper viewing distances, Improper viewing angle, ocular diseases, medical diseases and ageing and environmental and Computer factors-poor lighting, imbalanced of light between the computer screen and the surrounding, poor resolution, poor contrast, glare of the display and slow refresh rate.(15)

The discomfort associated with computer usage has not yet been proven to result in permanent damage, but may cause a reduction in work accuracy. This can reduce productivity by as much as 40%.(16)

The most important approach in the management of computer vision syndrome is eliminating the causative factor leading to the symptoms. Many of the symptoms in computer vision syndrome can be prevented by proper strategies at the workplace. The preventive measures include:- environmental factor modification and proper self eye care by the worker.(15)

1.3 Literature review

1.3.1 Worldwide Magnitude of computer vision syndrome

Several studies have been done in different countries in order to investigate the magnitude of CVS among computers users.

Many studies in different areas showed that the prevalence of CVS nowadays ranges from 64% to 90% among computer users.(7)

Asthenopic symptoms in computer users are a major complaint in subjects with CVS. The study conducted in India in 2008 result showed that among from 400 computer operators the prevalence of asthenopic symptoms in computer users were 46.3%.(17) Similarly, in a similar year survey of 212 bank workers in Italy found asthenopic symptoms in 31.9% of the subjects.(18)

A cross sectional, questionnaire survey study in different universities in Malaysia (2013, n= 795 students), revealed that the prevalence of symptoms of CVS (one or more) was found to be 89.9%; the most disturbing symptom was headache (19.7%) followed by eye strain (16.4%).(19)

A cross-sectional study conducted in suburban area of Chennai (March-April/2014) on 416 final year Medical and Engineering (Computer science and Information technology streams) college students result showed that a total of 334 students reported a history of one or more of the symptoms of CVS. Hence, the prevalence of CVS was found to be 80.3% with most problems of 45.1% headache, 42.8% burning sensation and 31.2% dry eyes.(20) A similar study on Computer Use and Vision-Related Problems in Ajman, United Arab Emirate, from a total of 500 university students the prevalence of CVS was found to be 72%. The most common visual problems reported were 53.3% headache, 54.8% burning sensation and 48% dry/tires/sore eyes.(21)

A quantitative cross-sectional observational study on the prevalence of risk factors associated with Computer Vision Syndrome among computer works in São Paulo, Brazil, in 2014 showed that the prevalence of Computer Vision Syndrome was 73.9%), and the symptoms reported were headache (68.2%), eye fatigue/strain (54.6%), burning sensation (54.6%), tearing (43.9%) and blurring of vision (43.5%).(22)

In 2014, Vision Council of America initiated a cross-sectional study on the 45 national bank workers. These employees were from several different work groups, all spending more than 8 hrs daily at a computer. The study identified 48.9% employees within the company had CVS. The most experienced symptom identified was eye strain 15.7%.(23)

A 2007 G.C. Case Study in University of Benin, Nigeria for Evaluation of Vision-Related Problems amongst Computer Users revealed that the most prevalence symptoms experienced by computer users were blurred distance vision (45.7%) eyestrain (42.7%) and headache (28.2%).(24) Similar study in Egypt among computer operators found that 92% complained of tired eyes, 37.33% complained of dry eyes, 68% complained of headaches, 68% complained of blurred distant vision and 45.33% complained of eye strain/fatigue.(25)

Institution based cross sectional study in University of Gondar in 2014 among secretaries and data processors result showed that 73.9% from 284 study participants were found to suffer from computer vision. The symptoms most experienced by study participants were blurred vision (31%) and eye strain (25%).The rest symptoms were headache (22.2%), redness of eyes (20.1%), watery eyes (19.4%), dryness of eyes (13.4%), double vision (8.8%), and eye irritation were found to be 7.7%.(26)

1.3.2 Associated factors for computer vision syndrome

A Community-based cross-sectional study of 150 subjects was carried out at the Teerthanker Mahaveer University (TMU), Moradabad, Uttar Pradesh, India from January 2012 to July 2012, to evaluate the factors contributing to Ocular complaints in computer users revealed that Most females were using computer for less than 6 hrs (41%) while most male subjects were using computer for more than 6 hours (79.1%). Redness was more frequent with glass nonusers. It was also found that eyestrain and headache had a significant association in subjects not maintaining proper distance from the computer. Study result also depicted that eyestrain was less when subjects maintained top of the screen level below the eyes. Similarly eyestrain was reported more on subjects who do not use antiglare screen. It was also observed from the study that eyestrain and watering eye were reported by more number of subjects who work with computers without adjusting the brightness of the screen. Study also showed that eyestrain and burning of eyes was found with subjects not taking breaks during computer use.(27)

A cross sectional, questionnaire survey study to determine the prevalence of CVS symptoms, knowledge and practices of computer use and to evaluate the association of various factors in computer use with the occurrence of symptoms in a total of 795 students studying in different universities in Malaysia, revealed that Students who used computers for more than 2 hours experienced symptoms of CVS significantly more often than those who used computer up to 2 hours. Students who were wearing spectacles experienced symptoms significantly more often than those who were not wearing spectacles. There was significant reduction in symptoms of CVS between students who viewed the computer screen below eye level than those who viewed the screen at or above the eye level.(19)

A 2014 suburban area of Chennai study on prevalence and associated factors revealed that redness; burning sensation; blurred vision and dry eyes were comparatively more in males than in females. Males had a higher risk of developing dry eyes. On the other hand, males were at lower risk of developing headache compared to females. Students who were using computer for 4-6 hrs were at significantly higher risk of developing redness, burning sensation and dry eyes compared to those who use computer for less than 4 hrs. Significant Correlation was found between increased hours of computer use and the symptoms redness, burning sensation, blurred vision and dry eyes. Students who took a break after every 2 hr of continuous use of computer had a higher risk of developing blurred vision, dry eyes and neck and shoulder pain as compared to those who took a break every hour. Significant correlation was found between taking less frequent breaks while working on computers and the symptoms blurred vision and dry eyes. Out of 176 students wearing either spectacle or contact lens, 72.2% of them had ocular symptoms of CVS. Students wearing corrective lens either spectacle or contact lens (n = 176) showed a higher risk of developing headache and blurred vision and it was statistically significant.(20) Similarly a study on Computer Use and Vision-Related Problems in Ajman, United Arab Emirate, revealed that dry/tired/sore eyes was more in students viewing the screen at a distance less than 50 cm. When the screen was viewed at distance more than 50 cm, the prevalence of headaches decreased by 38% compared with students who were using a viewing distance of less than 50 cm. Prevalence of tired eyes increased by 89% when screen filters were not used. With regards to gender, females are 78% more at risk of developing headache than males.(21)

Predisposing factors for CVS according to the study conducted at UoG indicated that; Age, total years of work on the computer and working hours on the computer per-day were independently associated factors for computer vision syndrome. Those secretaries and data processors who were in the age range between 26-35 and those greater than or equal to 36 were two times more likely to develop CVS when compared to those age less than or equal to 25 respectively. Secretaries and data processers used computers for > 7 hours per-day were 2 times more likely to have suffered from CVS as compared to those who used computers <7 hours per-day.(26)

1.4 Justification of the study

Computer users are generally encouraged; this is to keep up with the fast moving world of technology, research and science. Researchers have come to an agreement that this could actually be harmful, if not properly managed for future generation.(28)

Today, in virtually every corporate cubicle and backroom office, on the desks of every bank workers, sits a computer that allows writing, designing, computing and communicating faster than ever could before. The more time spend working at a computer; the knowledge of how to use the computer and the computer screen by itself has a great contribution for the problems related with computer users.

It is known that CVS is a worldwide problem, but in Ethiopia there is limited evidence to prove the magnitude and risk of the problem, especially those peoples who spent most of their time on computer use, like bank workers. Therefore, doing this study will be important to know the magnitude and risk factors of computer users. In addition the study will be a baseline data for further studies about the problem.

Accordingly, the study will be conducted in Gondar city among bank workers who spent most of their time on computer.

2. OBJECTIVES

2.1 General objective

To assess the prevalence and associated factors of computer vision syndrome among bank workers in Gondar city, Northwest Ethiopia, 2015.

2.2 Specific objectives

To determine the prevalence of computer vision syndrome among bank workers in Gondar city.

To identify associated factors of computer vision syndrome among bank workers in Gondar city.

3. METHODS AND MATERIALS

3.1 The study design

Institution based quantitative cross-sectional study design was conducted.

3.2 Study area and study period

The study was conducted from May 5-June 15/2015 G.C in Gondar city, which is the city of North Gondar zone located in North-west of Ethiopia. Gondar city, which is located about 750 kilometers northwest from the national capital, Addis Ababa and about 180 km from Bahir Dar city, the regional capital of the Amhara. Gondar is one of the ancient and largely populated city of the country, having a population of about 303,815. It has a latitude and longitude of 12°36′N 37°28′E with an elevation of 2133 meters above sea level.(29) In Gondar city nowadays there are about 33 governmental and non-governmental banks serving the community.

3.3 Source/Study Population:

All computer user bank workers were the study and reference population.

3.4 Inclusion and exclusion criteria

3.4.1 Inclusion criteria

Computer user bank workers were included in the study.

3.4.2 Exclusion criteria

Computer user bank workers who had ocular disease like: acute, chronic, infective conjunctivitis, any specific eyelid disorders.
Computer user bank workers who had uncorrected refractive error and other binocular vision problems.

3.5 Variables of the study

3.5.1 Dependent variables

Computer vision syndrome

3.5.2 Independent variables

Socio demographic variables-

- Age
- Sex
- Marital status
- Educational level

Personal variables

- Seating position
- Viewing distances
- Level of the top of the computer screen
- Duration of computer use (years)
- Working time on computer per day (hrs/day)
- Habit of taking break while using computer
- Habit of frequent voluntary blinking
- Eye glasses
- Any systemic disorders

Computer and Environmental variables

- Adjustment of contrast and brightness
- Glare on the display
- Using of anti-glare reflection

3.6 Operational definitions

Appropriate Seating position- The face of the operator just level to the computer screen.(30)

Bank workers- Are professionals who work on governmental and private banks.

Computer user- Bank workers who use disk top or laptop computer for their daily work at the bank arena.

Computer vision syndrome- At least one of the asthenopic symptoms of eyestrain, eye fatigue, blurred vision, headache, dry eye, watery eye, blurred vision, double vision, irritation and burning sensation of the eyes that occur as a result of computer use.(24)

Level of the top of the computer screen- Eye level should be 1/3 of the top of the computer screen.(30)

Viewing distance- The distance between the user and the computer screen.

3.7 Sample size determination

The sample size is determined by using the single population proportion formula on the following assumption. Level of significance (α) = 5% (with confidence level of 95%) Marginal error (29) = 5%, P=0.739 (previous study on secretaries and data processors at Gondar university). A Z-value of 1.96. (n= sample size, P= proportion, w= marginal error.

$$n = \frac{(z\ \alpha/2)^2\ p\ (1-p)}{w^2}$$

$$= \frac{(1.96)^2\ (0.739)*(0.261)}{(0.05)^2}$$

n= 297

The population was less than 10,000 (which is 308), so by using the correction formula

nf = N/1+n/N

nf =157

After adding 10% for non-response rate the final sample size were 172 bank workers.

But in this study computer users who were not eligible for the study were excluded and for the confidence of the research power, all computer user bank workers (n= 308) were the final sample size.

3.8 Data collection procedures

3.8.1 Data collection instruments

Pre-tested structured questionnaire was prepared in English and translated in to Amharic for obtaining information on socio-demographic characteristic and personal factors for CVS and then translated back in to English for data entry and analysis. Observation with check list was also used to assess personal, computer and environmental risk factors for CVS.

3.8.2 Data collection procedure

Four data collectors (Optometrists) were involved in the data collection procedure. Face to face interview using pre-tested standardized questionnaires and direct observations with check list was used to measure personal and environmental factors by an Optometrist. Snellen visual acuity card, pinhole, torch and viewing distance measurement meter were used for clinical evaluations. There were an optometrist supervisor and principal investigator during data collection.

3.8.3 Data quality control

Questionnaire was pre-tested and structured. Training was given for data collectors and supervisor for one day on how to collect data on study subjects, on how to use the questionnaire. The collected data was checked out for the completeness, accuracy and clarity by the principal Investigator and supervisor on daily basis. The supervisor was check the filled data daily and amendments were done at the spot. The supervisor signed on the filled questionnaire after checking their completeness. Data clean up and cross-checking was done before analysis.

3.8.4 Data management and analysis

After coding, data was entered using EPI INFO 7 and exported and analyzed by using SPSS version 20. Analysis was done by the investigator using the same computer package. Descriptive statistic and logistic regression was carried out to compute the different rate, proportion and relevant associations with 95% CI.

3.9 Ethical Consideration

Before conducting the study, ethical clearance was obtained from UoG. Oral consent of each participant was taken after explaining the purpose of the study. Confidentiality of the information was maintained thoroughly by excluding names as identification in the questionnaire and keeping their privacy during data collection and also individual results was kept secure by locking.

3.10 Dissemination and Utilization of Results

The study findings were submitted to university of Gondar, department of Optometry, College of Medicine and Health Sciences. Feedback of the result for each of the computer user bank workers after presentation for Optometry staffs and other respective bodies will be considered. Publication in scientific journal and online dissemination and presentation on conference will be still considered.

4. RESULT

4.1 Socio-Demographic Characteristics of Computer user Bank Workers

A total of 304 computer user bank workers were included in the study with response rate of 98.7%. From the study participants 198 (65.1%) were males. The mean age of study participants was 28.29(± 4.66) years.

Table 1: Socio-Demographic Characteristics of computer user bank Workers in Gondar city, 2015, n=304.

Variable		Frequency	Percent
Age			
	<25	93	30.6
	25-30	141	46.4
	>30	70	23.0
Sex			
	Female	106	34.9
	Male	198	65.1
Marital status			
	Single	181	59.5
	Married	120	39.5
	Divorced	3	1.0
Educational status			
	Diploma	41	13.5
	Degree	239	78.6
	Masters and above	24	7.9

4.2 Prevalence of computer vision syndrome

Seventy three present 73% (With 95% CI: 68.04, 78.02) of the study participants were suffered from computer vision syndrome.

The symptoms most experienced by study participants were blurred vision (42.4%), headache (23.0%) and redness (23.0%).

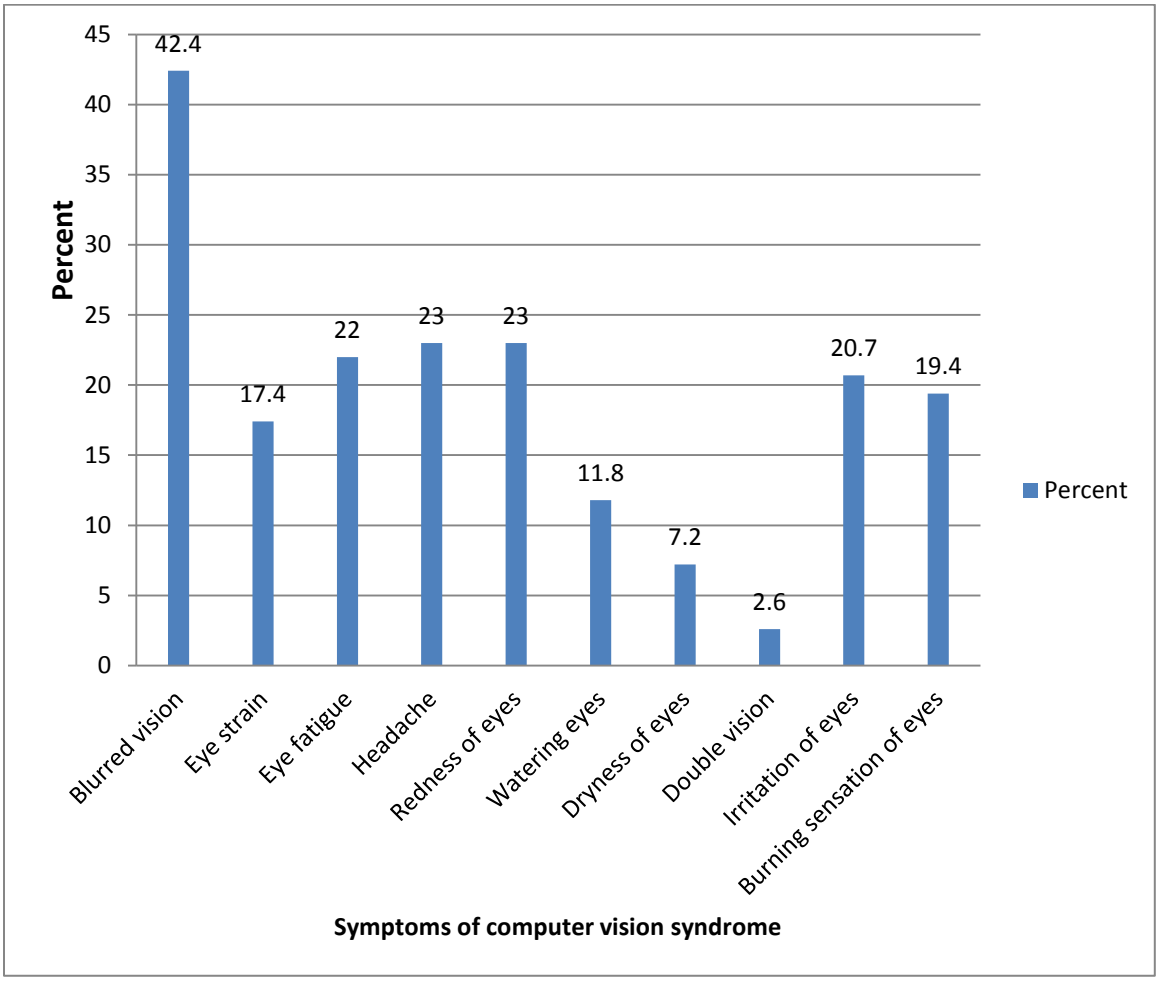

Fig.1 Prevalence of symptoms of computer vision syndrome among bank workers in Gondar city, 2015, n=304.

4.3 Associated factors of computer vision syndrome

In the Bivariate analysis: sitting position, viewing distance, working time on the computer per day, the time taking break while using computer and using eye glasses were significantly associated with computer vision syndrome.(see table 2).

Table 2: Bivariate Analysis for Computer Vision Syndrome among Bank Workers in Gondar City, 2015, n=304.

Variables	**Computer vision syndrome**		**95% CI**	***p-value***
	Yes	No	COR	
Sex				
Male	151	47	1.58 (0.94,2.67)	0.083
Female	71	35	1.00	
Age (years)				
>30	54	16	1.24(0.60,2.55)	0.558
26-30	100	41	0.89 (0.50,1.61)	0.339
<=25	68	25	1.00	
Marital status				
Married	91	29	1.27 (0.75,2.14)	0.374
Unmarried	131	53	1.00	
Educational level				
Degree and above	193	70	1.14 (0.55,2.36)	0.722
Diploma	29	12	1.00	
Sitting position				
Not appropriate	89	17	2.56 (1.41, 4.65)	0.002
Appropriate	133	65	1.00	
Viewing distance				
<= 50 cm	66	14	2.05 (1.08,3.91)	0.028
>50 cm	156	68	1.00	

Top of the computer screen				
Below the level of eyes	54	18	1.29(0.684,2.42)	0.435
Above the level of eyes	56	16	1.50 (0.78, 2.87)	0.222
At the level of eyes	112	48	1.00	
Duration of computer use				
>= 5 years	75	25	1.16 (0.67, 2.00)	0.587
<5 years	147	57	1.00	
Time of computer use per day				
>6 hrs	170	56	1.52 (0.87,2.66)	0.144
<= 6 hrs	52	26	1.00	
Taking break				
>20 minutes	167	49	2.05 (1.20,3.49)	0.009
<= 20 minutes	55	33	1.00	
Eye glass				
Using eye glasses	31	4	3.17 (1.08,9.27)	<0.001
Not using eye glasses	191	78	1.00	
Frequent voluntary blinking				
Yes	67	22	1.00	
No	155	60	1.18 (0.67,2.08)	0.569
Adjusting computer brightness				
Yes	91	32	1.00	
No	131	50	1.09 (0.65, 1.82)	0.757
Glare on the display				
Yes	82	23	1.50 (0.86, 2.61)	0.149
No	140	59	1.00	
Using anti-glare				
Yes	69	22	1.00	
No	153	60	1.23 (0.70, 2.16)	0.473
Any systemic disease				
Yes	18	5	1.36 (0.49,3.79)	0.558
No	204	77	1.00	

Multivariate analysis was used to identify characteristics that were independent factors for computer vision syndrome. According to the multivariate analysis inappropriate sitting position was 2.33 times (AOR=2.33, 95% CI=1.27, 4.28) more likely exposed to computer vision syndrome when compared with appropriate sitting position. Working on computer without taking break more than 20 minutes was significantly (AOR=1.93, 95% CI=1.11, 3.35) associated with computer vision syndrome as compared with taking break within 20 minutes (see table 3).

Table 3: Multi-Variate Analysis for Computer Vision Syndrome among Bank Workers in Gondar City, 2015, n=304.

Variables	**Computer vision syndrome**		**95% CI**		***p-value***
	Yes	No	COR	AOR	
Sitting position					
Not appropriate	89	17	2.56 (1.41, 4.65)	2.33 (1.27,4.28)	0.006
Appropriate	133	65	1.00	1.00	
Taking break					
>20 minutes	167	49	2.05 (1.20,3.49)	1.93 (1.11, 3.35)	0.020
<= 20 minutes	55	33	1.00	1.00	
Eye glass					
Using eye glasses	31	4	3.17 (1.08,9.27)	3.19 (1.07, 9.51)	0.038
Not using eye glasses	191	78		1.00	

Blurred vision, redness of eyes, headache and eye fatigue were more prevalent in males than females. Working on computer without break more than 20 minutes were more risk for symptoms of CVS than taking break within 20 minutes.(see table 4)

TABLE 4: Most Prevalent Symptoms of CVS with Independent Factors among Bank Workers in Gondar city, 2015, n=304.

Variable	Blurred vision	Redness	Headache	Fatigue	Eye strain
	%	%	%	%	%
Sex					
Male	43.9	25.8	20.2	25.8	20.2
Female	39.6	17.9	28.2	15.1	12.3
Sitting position					
Not appropriate	47.2	29.2	30.2	26.6	25.5
appropriate	39.9	19.7	19.2	21.2	13.1
Viewing distance					
<= 50 cm	50.0	23.8	27.5	21.2	21.2
>50 cm	39.7	22.8	21.4	23.3	16.1
Taking break					
>20 minutes	46.8	24.1	26.4	23.1	19.0
<= 20 minutes	31.8	20.5	14.8	19.3	13.6
Eye glass					
Using eye glass	51.4	34.3	28.6	22.9	25.7
Not using eye glass	41.3	21.6	22.3	21.9	16.4
Glare on the display					
Yes	55.2	23.1	17.1	18.1	14.3
No	35.7	22.9	26.1	29.5	19.1

5. DISCUSSION

This study was aimed to assess the prevalence and identify the associated factors of CVS. From the total of 304 computer user bank worker study participants the prevalence of CVS was found to be 73% (95% CI: 68.04, 78.02). This is in line with the other studies; 72% in Ajman, United Arab Emirate, among computer worker university students(21), 73.9% in São Paulo, Brazil, among computer workers(22) and 73.9% in University of Gondar, among secretaries and data processors(26). Of course this study result was less than the result reported in Malaysia which was found to be 89%(19) and Chennai which was 80.3%(20), the reason may be either due to the study participants in these area who were university students used computers for a longer time than bank workers or due to students who were using computers for long time without eye break for studying rather than most bank workers were taking frequent break to give services for customers.

The prevalence of CVS in this study also higher than the studies conducted in Vision Council of America which was 48.9%(23), this could be due to that those bank workers in Vision Council of America might use protective eye glasses or glare protective computer screen and might have safe working environment as well as could have better awareness about the problems and protection mechanisms.

Blurred vision 42.4% (95% CI: 36.99, 47.88) and headache 23% (95% CI:18.29, 28.76) were the most experienced symptoms in this study which is in agreement to the study conducted in Benin, Nigeria, among Computer users blurred vision 45.7% and headache 28.2%(25) and in University of Gondar among secretaries and data processors blurred vision 31% and headache 22.2%.(26) This can be explained that the computer screen is a very different visual environment from the printed page that made up of tiny dots or pixels which is difficult for the eye to focus on steadily. Poor definition of these images, compared with the clarity of a printed page, causes the eyes to work harder. This forces our eye muscles to refocus continuously at the computer screen more than thousands of focusing cycles in a typical workday which leads symptoms blurred vision and headache.(13)

Blurred vision, redness of eyes, eye strain, eye fatigue, dryness of eyes, burning sensation and irritation were more prevalent among males as compared with females whereas females were more risk for developing headache. The result was similar with the study conducted in suburban area of Chennai reported that redness, burning sensation, blurred vision and dry eyes were comparatively more in males than in females. On the other hand, females were at higher risk of developing headache compared to males (20). These symptoms more prevalent in males than females may also be explained by most females were using computer for less than 6 hrs 42%, while most male subjects were using computer for more than 6 hours 67.7%. Which was almost similar with the result in Uttar Pradesh, India, females were using computer for less than 6 hrs (41%), while male subjects were using computer for more than 6 hours 79.1%.(27)

Inappropriate sitting position of bank workers was 2.3 times (AOR=2.33, 95% CI=1.27, 4.28) more likely to exposed for computer vision syndrome as compared to those who have appropriate sitting position. This might be explained that inappropriate sitting position makes discomfort and stress to the eye which leads the eye more focused which causes the eye muscles more spastic and experienced symptoms of computer vision syndrome, on the other hand in an inappropriate sitting position bank workers report glare as their major complain which faced during computer use. It can also be justified that eye and environmental related condition that occurs due to inappropriate sitting position, when the viewing demands of the task exceeds the visual abilities of the user leading to inability to focus properly on computer images and experienced Computer vision syndrome.(15)

Working on computer without break for more than 20 minutes was nearly 2 times (AOR=1.93, 95% CI=1.11, 3.35) more likely to have suffered from computer vision syndrome as compared to taking break within 20 minutes. This was similar to the study done in suburban area of Chennai and in Uttar Pradesh, India, that significant correlation was found between taking less frequent breaks or working on computer more than 20 minutes without break been more exposed for symptoms of computer vision syndrome as compared to taking more frequent breaks within 20 minutes (20, 27). These bank workers who had not been taking break within 20 minutes suffered from CVS more significantly, because the eyes normally cannot remain focused on the pixel-generated images on a computer screen and as such, the eyes must focus and refocus thousands of times by taking frequent breaks (high refresh rate that the computer screen is repainted to produce an image) within 20 minutes while viewing the screen, if the refresh rate is too slow it causes a high flickering screen which suffered from symptoms of CVS. (15)

Bank workers who wore eye glasses were 3 times (AOR=3.19, 95% CI =1.07, 9.51) more likely exposed for computer vision syndrome as compared with not wearing eye glasses. Similar result were reported in Malaysia, computer users who were wearing spectacles experienced CVS significantly more often than those who were not wearing spectacles(19).

The study also depicted that 88.6% (with 95% CI: 78.03, 99.11) of wearing eye glasses were had been symptom of CVS. The most experienced symptoms were blurred vision, headache and redness of eye, this was almost similar with the symptoms most experienced in studies conducted in Chennai revealed that from 176 spectacle/contact lens wearers 72.2% had ocular symptoms of CVS with higher risk of developing headache and blurred vision (20), Of course the figure has a little bit higher value as compared with the previous study which may be due to the reason that the study participants in this study who wear spectacles were small in number which is 35 spectacle wearers and spectacles might lack of surface treatment. Other justification for higher prevalence of CVS among eye glass wearers might be spectacles were not been prescribed by professionals that resulted either incorrect prescription or absence of glare or reflection protection surfaces.

6. LIMITATIONS

The study did not include full ophthalmic examination because of lack of instruments and the symptoms were self-reported

The study didn’t show the prescribed spectacles were prescribed by the professionals or not.

The study may suffered from measurement bias and misclassification bias

7. CONCLUSION

About three-fourth of computer user bank workers were suffered from computer vision syndrome with the most experienced symptoms of blurred vision, headache and redness of eyes.

Inappropriate sitting position, working on the computer without taking frequent break for more than 20 minutes and wearing of eye glasses were independently associated factors with computer vision syndrome.

8. RECOMMENDATIONS

Based on the results of this thesis findings the following respective bodies will be recommended:

For computer users the following ergonomics is recommended:

Better to site appropriately with face just towards to the computer screen and adjust the chair legs to be parallel with the computer screen.

Better to maintain appropriate viewing distance from the computer which could be greater than 50 cm.

Mainly better to take frequent break within 20 minutes while using computers

For bank managers:

Better to have computer sticker to prevent glare

For eye care professionals:

Better to give eye health education for computer users about the symptoms, treatment options and preventing strategies

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10. ANNEXES:

Annex I: consent form

Dear participants

The aim of this study is to assess the prevalence and associated factors of computer vision syndrome among bank workers in Gondar city, Northwest Ethiopia, 2015.

The purpose of this study is to generate information about magnitude of computer vision syndrome and associated factors among bank workers which may help for computer technology operators, managers and any computer users based on the findings.

The study will involve various intimate and computer use related questions. In order to effectively attain the objective of the research, your patience will take the lead. There are questions that you expected to answer related to personal and/environmental factors associated with computer vision syndrome and there is no need to tell your name. No individual responses will be reported. Your responses will be completely confidential. It is your full right to refuse in responding any question or all of the questions. However, your honest answers to these questions will help us in better understanding of magnitude and associated factors of computer vision syndrome.

So, I kindly request to give your honest responses and keep participation. It will take a maximum of 10 minutes to answer these questions.

Would you willing to participate please? Yes/No

If you are pleasurable to participate in the study, I will continue to the next.

For any further question, contact the investigator:

Name: Natnael Lakachew

Phone number: +251-910-08-89-03

E-mail: natiuog@gmail.com

Annex II: Information sheet to get permission for the research

Introduction:

The main aim of this research project was to assess the prevalence and associated factors of computer vision syndrome among bank workers. The research team included optometrists for data collection, principal investigator and senior advisors from University of Gondar, college of medicine and health sciences.

Name of Principal Investigator: Natnael Lakachew

Name of Advisors: Mr.Dawit Zenebe

Mr. Haile Woretaw

Name of the Sponsor: University of Gondar

This information sheet was prepared by the above mentioned researcher whose main aim was to assess the prevalence and associated factors of computer vision syndrome among bank workers in Gondar city, North West Ethiopia, 2015. The investigator is MSc. In Clinical Optometry with advisors from Department of Optometry, College of Medicine and Health Sciences, University of Gondar.

Purpose:

The purpose of the study was to assess the prevalence and associated factors of computer vision syndrome among bank workers in Gondar city, Northwest Ethiopia, 2015. Results from this study were used to make recommendations for computer user, information technology experts, and bank managers for better intervention for environmental factors.

Procedure:

The study used institution based cross-sectional study design, through face to face administered structured Questionnaire and observation with checklists. Permission was obtained from the University of Gondar, Bank managers and from each computer users included in the study.

Risk and Benefits:

Risks: There was no any risk or discomfort that would face by participating in this research except dedication of time for responding the questionnaires. Every piece of information was kept confidentially. There was no any risk in participating in this research project.

Benefits: Though you might not be the direct beneficiaries of this research, the information generated from this research used to reduce computer related visual problems. Study participants were had no incentives or payments due to their participation.

Confidentiality:

All Personal identifiers & personal information were not been taken. The information collected from this research project was kept confidential. Information was accessed only by the researcher.

Right to refuse or withdraw:

you do not have to tell your name to the data collector and all your responses and results obtained will be kept confidentially by using coding system whereby no one have access to your responses. It is your full right to refuse in responding any question or all of the questions.

Persons to contact:

This research project was reviewed and approved by the ethical committee of the University of Gondar. If you have any question you may contact the following individuals.

Investigator: Natnael Lakachew

Mobile: +252-918-03-22-16

E-mail: natiuog@gmail.com

Advisors: 1. Mr.Dawit Zenebe

2. Mr. Haile Woretaw

Annex III: English version of questionnaire

UNIVERSITY OF GONDAR

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF OPTOMETRY

Face to face interview Questionnaire for assessment of prevalence and risk factors of computer vision syndrome among bank workers in Gondar city.

Questionnaire identification number_____

Name of Bank_____

Verbal consent form:

Hello, my name is _____working in university of Gondar, department of Optometry. Today I am here to ask you few questions related to the computer use.

The study will involve various intimate and computer use related questions. In order to effectively attain the objective of the research, your patience will take the lead. There are questions that you expected to answer related to personal and/environmental factors associated with computer vision syndrome and there is no need to tell your name. No individual responses will be reported. Your responses will be completely confidential. It is your full right to refuse in responding any question or all of the questions. However, your honest answers to these questions will help us in better understanding of magnitude and associated factors of computer vision syndrome. So, I kindly request to give your honest responses and keep participation. It will take a maximum of 10 minutes to answer these questions.

1. If yes, continue to the next page

2. If no, continue to the next participant by writing the reasons for refusal.

Part I: Socio-demographic data

1. Age _____
2. Sex
   - Female
   - Male
3. Marital status
   - Single
   - Married
   - Divorced
   - Widowed
4. Educational status
   - Certificate
   - Diploma
   - Degree
   - Master and above

Part II. Have you experienced any one of the following symptoms while using/ after finishing the work on computer? (May have more than one symptom, encircle it

- Blurred vision
- Eye strain
- Eye fatigue
- Headache
- Redness of eyes
- Watery eyes
- Dryness of eyes
- Double vision
- Eye irritation
- Burning sensation

Part III. Personal factors

1. Seating position
    - Appropriate /The face of the operator just level to the computer screen
    - Inappropriate
2. Viewing distances
    - Less than or equal to 50 cm
    - Greater than 50cm
3. Level of top the computer screen
    - Above the level of eyes
    - At the level of eyes
    - Below the level of eyes
4. Duration of computer use(years)
    - < 5
    - 5-10
    - > 10
5. Working time on computer per day (hrs/day)
    - < 3
    - 3-6
    - >6
6. Do you have a habit of taking break while using computer?
    - Yes
    - No
7. If the answer for question no.6 is yes, by how much minute after work?
    - <20 minutes
    - >20 minutes
8. Do you use eye glass?
    - Yes
    - No

9. If the answer for question no.7 is yes, what is the purpose of the glass?
    - For computer use
    - For vision
    - For other purpose
10. Do you have a habit of frequent voluntary blinking?
    - Yes
    - No
11. Do you have any systemic disorders?
    - yes
    - No
12. If yes for NO. 10 specify disease ----------

Part IV. Computer and Environmental variables

1. Do you adjust the contrast of your computer with the surrounding brightness?
    - Yes
    - No
2. Is any glare on the computer screen?
    - Yes
    - No
3. Do you use of anti-glare for your computer screen?
    - Yes
    - No

Name and signature of data collector_____

Date of interview_____

Checked by supervisor_____

Name and signature_____

Annex IV: Amharic version of questionnaire

የቃለ-መጠይቅ ቅፅ፡

ጎንደር ዩኒቨርሲቲ

ሕክምናና ጤና ሳይንስ ኮሌጅ

ኦፕቶሜትሪ ትምህርት ክፍል

የቃለ-መጠይቅ መለያ ቁጥር_____

የባንኩ ቅርንጫፍ ስም_____

ኮምፒዩተር ከመጠቀም ጋር የተያያዙ የእይታ ችግሮች ላይ ጥናት ለማድልግ የተዘጋጀ ቃለ-መጠይቅ፡

ጤና ይስጥልኝ ስሜ_____ይባላል፡፡ የመጣሁት ከጎንደር ዩኒቨርሲቲ የዓይን ህክምና ኦፕቶሜትሪ ትምህርት ክፍል የምርምር አባል ነው፡፡ ዛሬ ከዚህ የመጣነው ኮምፒዩተር ከመጠቀም ጋር የተያያዙ የእይታ ችግሮች ላይ ለምናደርገው ጥናት የሚረዱ አንዳንድ ጥያቄዎችን ለመጠየቅ ነው፡፡

የዚህ ጥናት ዋና አላማ በ2007 ዓ.ም በጎንደር ከተማ በሚገኙ ባንክ ቤቶች ካሉት የኮምፒውተር ተጠቀሚ ሰራተኞች መካከል ኮምፒውተር መጠቀም የሚያስከትለውን የእይታ ችግር መጠንና ለበሽታዉ መከሰት ተያያዥ የሆኑ ምክንያቶችን ለማጥናት ነው፡፡ እርስዎም የዚህ ጥናት አንድ አካል በመሆን ተመርጠዋል፡፡የጥናቱ ጥቅም የችግሩን መጠን በፐርሰንት ምን ያህል እንደሆነ እርስዎ በሚሰጡን መላሽ፣ የኮምፒውተር አጠቃቀምዎትን ና የሚሰሩበትን ቦታ በማየት መረጃዎችን በማሟላት በተገኘው ውጤት መሰረት መረጃውን ለኮምፒውተር ስልጣኔ ባለሙያዎች፣ለማናጀሮች እንዲሁም ለኮምፒውተር ተጠቃሚወች በማሳወቅ ችገሩን ለመከላከል የሚረዱ አቅጣቻዎችን ለመቀይሰ ይረዳል በሚል ነዉ፡፡

በጥናቱ ውስጥ ለችገሩ መከሰት ተያያዝነት ያላቸው ግላዊ እና ኮምፒውተር ከመጠቀም ጋር ተያያዥነት ያላቸው ጥያቄዎች በመጠይቁ ተካተዋል፡፡ ጥናቱ በትክክል አላማውን እንዲያሳካ የእርሰዎ ትብብር ቀዳሚውን ድርሻ ይወስዳል፡፡ በዚህ መጠይቅ ላይ ስም መፃፍ አያስፈልግም፤የማንኛውም ግለሰብ ሃሳብ ብቻውን ይፋ እንዲዎጣ አይደረግም፤ ሀሳቡ ሙሉ በሙሉ በሚስጥር የተጠበቀ ነው፡፡ በመጠይቁ ያለመሳተፍ እና በሙሉም ሆነ በከፊል ጥያቄዎችን ያለመመለስ ሙሉ መብት አለዎት፡፡ ስለዚህ ግልፅ የሆነ ምላሽንና ንቁ ተሳትፎዎን እንዲሰጡን በአክብሮት እንጠይቃለን፡፡ መጠይቁን ለመሙላት ሊወስድ የሚችለው ጊዜ ቢበዛ 1o ደቂቃ ብቻ ነው፡፡

ለመሳተፍ ፈቃደኛ ነዎት? ለመሳተፍ ፈቃደኛ ከሆኑ ወደ ሚቀጥለው ገፅ ልለፍ፡

ክፍል አንድ፡- ማሕበራዊ መረጃዎች

1. እድሜ _____
2. ጾታ
   - ☐ ሴት
   - ☐ ወንድ
3. የጋብቻ ሁኔታ

   - ☐ ያላገባ/ች
   - ☐ ያገባ/ች
   - ☐ የፈታ/ች
   - ☐ የሞተባት/ችበት

4. የትምህርት ደረጃ
   - ☐ ሰርተፍኬት
   - ☐ ዲፕሎማ
   - ☐ ዲግሪ
   - ☐ ሁለተኛ ዲግሪ ና በላይ

ክፍል ሁለት፡- ከሚከተሉት የዐይን በሽታ ምልክቶች ውስጥ ኮምፒውተር ሲጠቀሙ ወይም ከተጠቀሙ በኃላ የሚያጋጥምዎት የትኛውን ነው /ከአንድ በላይ መምረጥ ይቻላል/

- ☐ የእይታ መደብዘዝ
- ☐ ዓይንን የመሳብ/የመወጠር ስሜት
- ☐ የዓይን መድከም
- ☐ የራስ ህመም
- ☐ የዓይን መቅላት
- ☐ የእምባ መፍሰስ
- ☐ የዓይን ድርቀት
- ☐ አንደ ነገር ሁለት ሆኖ መታየት
- ☐ የዓይን መቆጥቆጥ
- ☐ የዓይን ማቃጠል

ክፍል ሦስት፡- ከግለሰቡ ኮምፒውተር አጠቃቀም ጋር ተያያዥነት ያላቸው መረጃዎች

1. የኮምፒውተር ተጠቃሚው የአቀማመጥ ሁኔታ

   - ☐ ተገቢ ነው/ ተጠቃሚው ፊትለፊት ከኮምፒዩተሩ ትይዩና በትክክል ቀጥ ብሎ የተቀመጠ/
   - ☐ ከተገቢው አቀማመጥ ውጭ ነው

2. ኮምፒዩተሩ ከዐይንዎ ያለው ርቀት

   - ☐ 50 ሴ.ሜ ና በታች
   - ☐ ከ 50ሴ.ሜ በላይ

3. የኮምፒዩተሩ የላይኛው ጠርዝ ከኮምፒዩተር ተጠቃሚው የዐይን እይታ ያለበት ደረጃ
   - ☐ ከ ዐይን ትይዩ በላይ
   - ☐ በዐይን ትይዩ
   - ☐ ከዐይን ትይዩ በታች

4. ኮምፒዩተር መጠቀም ከጀመሩ ስንት ዓመት ይሆንዎታል?
   - ☐ ከ 5 ዓመት በታች
   - ☐ ከ5-10 ዓመት
   - ☐ ከ 10 ዓመት በላይ
5. በቀን ለስንት ሰዓት ኮምፒዩተር ይጠቀማሉ?
   - ☐ ከ 3 ሰዓት በታች
   - ☐ 3-6 ሰዓት
   - ☐ ከ 6 ሰዓት በላይ

6. ኮምፒዩተር ሲጠቀሙ ዐይንዎትን የማሳረፍ ልምድ አለዎት?
   - ☐ አዎ
   - ☐ የለኝም

7. ለተራቁጥር 7 መልስዎ አዎ ከሆነ፤ በየስንት ደቂቃ
   - ☐ ከ 20 ደቂቃ በታች
   - ☐ ከ 20 ደቂቃ በላይ

8. የዐይን መነፀር ይጠቀማሉ?
   - ☐ እጠቀማለሁ
   - ☐ አልጠቀምም

9. ለተራቁጥር 8 መልስዎ አዎ ከሆነ፣ መነፀሩን ለምን ይጠቀሙበታል?
   - ☐ ለኮምፒዩተር
   - ☐ ለእይታ ማስተካያ
   - ☐ ለሌላ ጥቅም

10. ኮምፒዩተር ሲጠቀሙ ዐይንዎትን በፍላጎትዎ የመርገብገብ/ጭፍን ግልጥ የማድረግ/ ልምድ አለዎት?
    - ☐ አዎ
    - ☐ የለኝም

11. በሀኪም የታወቀ የጤና ችግር አለብዎት
    - ☐ አዎ
    - ☐ የለብኝም

12. ለተራቁጥር 9 መልስዎ አዎ ከሆነ ያለብዎትን የጤና ችግር ቢነግሩን ----------

ክፍል ሦስት፡-ከኮምፒውተርና ከስራ አካባቢ ጋር ተያያዥነት ያላቸው መረጃዎች

1. የኮምፒዩተሩን ብርሃን ከአካባቢው ብርሃን ጋር አመጣጥነው/አስተካክለው ይጠቀማሉ?
   - ☐ አዎ አስተካክላለሁ
   - ☐ አላስተካከልም

2. የሚጠቀሙበት ኮምፒዩተር ብርሃን ያንፀባርቃል?
   - ☐ አዎ
   - ☐ አያንፀባርቅም

3. የኮምፒዩተሩን ማንፀባረቅ የሚቀንስ ነገር ይጠቀማሉ?
   - ☐ አዎ እጠቀማለሁ
   - ☐ አልጠቀምም

መረጃ የሰበሰበው ስምና ፊርማ_____

መጠይቁ የተደረገበት ቀን_____

መረጃውን ያረጋገጠው ስምና ፊርማ _____

ቀን_____

DECLARATION:

This research thesis entitled “Prevalence and associated factors of computer vision syndrome among bank workers in Gondar city, Northwest Ethiopia, 2015” was carried out by me under the supervision of Mr. Dawit Zenebe (BSc, MPH) and Mr. Haile Woretaw (BSc, MSc) in department of Optometry, College of medicine and health science, and University of Gondar for the award of MSc. Degree in Clinical Optometry. I declare that this is my original work and has not been submitted to any other university or institution.

Place of submission: University of Gondar

Date of submission_____

Name: Natnael Lakachew

Signature _____

Advisors:

Name	Signature	Date
1. Mr. Dawit Zenebe	_____	_____
2. Mr. Haile Woretaw	_____	_____

ASSURANCE OF INVESTIGATOR

I the undersigned investigator agree to accept responsibility for the scientific, ethical and technical conduct of the research project and the thesis has not been previously submitted in part or full for any degree for this or any university.

Name of the Investigator: Natnael Lakachew

Signature: _____Date: _____

Approval of the advisors

Advisors:

Name	Signature	Date
1. Mr. Dawit Zenebe	_____	_____
2. Mr. Haile Woretaw	_____	_____